Mutagenic and toxicological results from Ukrainian surface waters

Ukraine is a country of 46 million people with increasingly modern industrial cities as well as productive, fertile agricultural areas. Historically, Ukraine served as a center for agriculture and industry during much of the Soviet Union dominance. Legacy compounds (DDT, PCBs, metals and PAHs) exist in freshwater and marine systems from use during the Soviet period through modern day Ukraine. In addition to legacy compounds, contaminants of emerging concern including pharmaceuticals, personal care products and newer synthetic pesticides are being released into Ukraine's surface waters. Toxicity tests can integrate the toxicological signals of this milieu of compounds and allow managers to prioritize areas with high toxic signals. The objective of this research was to determine the toxicological and mutagenic effects of surface waters in the highly industrial area around Kyiv, and selected rivers in Ukraine. We used three toxicity assays: *Daphnia magna*, *Ceriodaphnia affinis* and *Colpoda steinii*, and a mutagenicity assay- the bacterium *Salmonella typhimurium* or Ames assay. *Daphnia magna* and *Ceriodaphnia affinis* toxicity tests are internationally well established assays for testing environmental water samples. The protozoan *Colpoda steinii* has been used in Ukraine and the Soviet Union as a local toxicity test organism for many years. The ability to obtain and maintain *C. steinii* in a cyst form, as well as its relatively short exposure time (10 min. - 3 hrs.) makes this an attractive test organism. The Ames assay is a widely used and accepted assay that assesses the mutagenic potential of chemical compounds. Results indicate that the *C. steinii* and the two daphnid species exhibited sporadic toxicity from six stations around Kyiv with the majority of the toxicity in both the influent and effluent of the Kyiv Municipal Treatment Plant. Toxicity in the Spring was generally higher than in the Fall for many rivers throughout Ukraine. The Ames assay indicated mutagenicity in the T98 strain in many areas throughout Kyiv and less mutagenicity outside of industrial areas. In addition to mutagenicity, cytotoxicity was noted in many of the samples. Mutagenicity was associated with high concentrations of polycyclic aromatic hydrocarbons (PAHs) measured in the dissolved and suspended solid fractions of the samples.